## Book Review

# Women in Mathematics: The Addition of Difference

*Reviewed by Ann Hibner Koblitz*

**Women in Mathematics: The Addition of Difference**
*Claudia Henrion*
*Indiana University Press, 1997*
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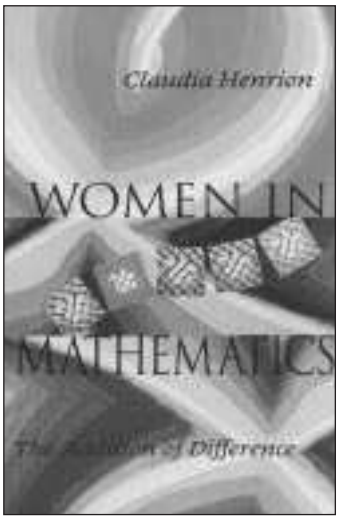
According to Claudia Henrion's introduction, this book is the product of years of research and has undergone many transformations during those years. At first, Henrion envisioned her work as a more or less straightforward depiction of the lives of a dozen or so successful women mathematicians. The message was essentially to be: "Since all of these women have created a niche for themselves in mathematics, other women can do the same" (p. xvii). Gradually, however, Henrion decided that:

> …this approach to the book was only half the work. Two interrelated questions continued to surface, and were not adequately addressed by this initial vision. First, why is it that women continue to be significantly underrepresented in mathematics, particularly at the highest levels of accomplishment? And second, why is it that even the most successful women in mathematics, those who have already made it by standard measures of success, often continue to feel (to varying degrees) like outsiders in the mathematical community? (pp. xvii–xviii)

Henrion came to the conclusion that there was a more basic question to be considered: "Are there ways in which the practices and ideology of this [mathematical] community create an atmosphere that prevents women from being completely accepted as full-fledged members?" (p. xvii)




Addressing this question meant that Henrion would have to identify the "ideology" of the mathematical community and investigate the impact of this ideology on women. The book in its final incarnation is thus a collection of interviews with prominent women mathematicians interspersed with musings about the ideology of the mathematical community and debunking of certain widespread myths about mathematicians and mathematical productivity. Underlying the whole narrative is the suggestion that while the women interviewed could successfully use mathematics as a way of breaking free of general societal prejudices about women's roles, it was less easy to break away from stereotypes *within* the mathematical community. "In this sense, while they could use mathematics as a refuge from the conflicting expectations of society, it was harder to escape the sometimes confining expectations of mathematics" (p. xix).

From 1988 to 1993 Henrion interviewed eleven women, and in 1996 she had follow-up conversations with all but one (Vivienne Malone-Mayes, who died in 1995). The women are Joan Birman,

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Lenore Blum, Fan Chung, Marcia Groszek, Fern Hunt, Linda Keen, Malone-Mayes, Marian Pour-El, Judy Roitman, Mary Ellen Rudin, and Karen Uhlenbeck. All except Groszek and Keen are given their own sections. (Keen, however, is barely referred to in the body of the work.)

In many respects, the interviews are the greatest strength of the book. Henrion's portraits make the subjects come alive; particularly vivid are her depictions of Roitman and Malone-Mayes, though all the women stand out as exciting, vibrant, impressive personalities.

Henrion is skillful at using the life stories of her interviewees to challenge some common misconceptions about the nature of the mathematical enterprise. Among the myths she debunks are: "mathematicians work in complete isolation" (this chapter is amusingly entitled "Rugged Individualism and the Mathematical Marlboro Man" and uses the stories of Karen Uhlenbeck and Marian Pour-El to illustrate her point); "women and mathematics don't mix" (here Mary Ellen Rudin and Fan Chung are highlighted); "mathematicians do their best work in their youth" (Joan Birman is the main example, but the book is dotted with refutations of this myth from the lives of both female *and* male mathematicians); "mathematics and politics don't mix" (the profiles are of Lenore Blum and Judy Roitman); and "only white males do mathematics" (Vivienne Malone-Mayes and Fern Hunt take center stage). The last chapter, which Henrion acknowledges will be the most controversial among mathematicians, takes on two more notions that she considers to be myths:"mathematics is a realm of complete objectivity" and "mathematics is nonhuman."

Henrion makes several concrete suggestions for changing the image of mathematics projected both inside and outside of the mathematical community. For example, she maintains that mathematicians should work to cultivate images of themselves as social beings rather than loner-misfits. (This could be problematic for some people, both men and women, who appear attracted to mathematics in part because their lack of social skills will not be held against them; see comments later in this review.) Collaboration should be encouraged in practice as well as in the image of mathematical work presented to the world at large.[1] And the community should recognize the implications of the fact that many mathematicians—especially, perhaps, women—do their best work later in life than the stereotypes assume. The restriction of the Fields Medal to mathematicians under forty thus becomes very questionable, even outright sexist.

Henrion also includes some insightful comments about women mathematicians' lack of confidence in themselves and their undervaluing of their own research. She notes that there is a tendency for women "to submit articles to less prestigious journals than they might be considered for." (p. 78) In fact, some editors of less prominent journals have remarked that their best papers are written by women (p. 274), presumably because the women set their sights too low when they decide where to submit their work. This undervaluing of their own achievements by women mathematicians can easily fuel the prejudices of their male colleagues and result in the work of the women being minimized by the mathematical community as a whole. It has, after all, been well documented that male academics (seemingly unconsciously) tend to assign higher status to males than to females on the basis of entirely equivalent credentials. For example, when asked to decide at what level they would recommend (fictitious) candidates for an appointment, chairs of science and mathematics departments have suggested the females for lower ranks than the males, although the résumés were completely comparable. (The most famous studies of this phenomenon were chronicled by Roberta Hall and Bernice Sandler; Henrion has references to their and many other studies of the same type on p. 274.) This unconscious tendency of some males to devalue women's credentials can only be exacerbated when the women themselves do not adequately recognize the worth of their own contributions to the field.

Despite everything that is interesting about this book, however (and there are parts of it that I like exceedingly well), it has some significant problems. One annoyance is the repetition of the same quotes in different sections; one keeps getting the feeling, to quote Yogi Berra, of "déjà vu all over again." Also, it's not always clear who says what; Henrion's voice and that of her interviewees are not consistently distinguished. And there is an unevenness of research methodology that can be disconcerting. For example, studies of the mathematical community that were originally published in 1951, 1971, or 1991 are treated as if they are all equally relevant for an analysis of the situation in 1997. It is unfair, however, to use a forty-year-old (or older) source to support a criticism of the mathematical community today.

It is also unfair to contort the story of an eminent woman mathematician of the past to conform to the author's viewpoint. The fact that Hermann Weyl alluded disparagingly to Sofia Kovalevskaia in his famous aphorism about women

[1] *Henrion appears unaware of the extent of collaboration in the mathematical community at the present time. According to Andrew Odlyzko ("Scholars in Cyberspace," November 3, 1997, talk at Wilfrid Laurier University, Waterloo, Canada), from 1940 to 1994 the percentage of single-authored papers abstracted in* Mathematical Reviews *has decreased from about 93% of the total to about 57%. I am grateful to him for sending me further information on this question.*

in mathematics—"There have been only two women in the history of mathematics, and one of them [Kovalevskaia] wasn't a mathematician, while the other [Emmy Noether] wasn't a woman"—in no way says anything about how Kovalevskaia was treated by mathematicians *during her lifetime*. Kovalevskaia was a well-respected member of the mathematical community of her time, widely considered by her peers as one of the best mathematical analysts of the age, and was fully integrated into professional life.[2] Yet Henrion uses Weyl's misogynist aphorism, which came into currency a good forty years after Kovalevskaia's death, as proof that Kovalevskaia, like all women mathematicians, however prominent, was considered an outsider.

In the same way, Henrion makes chronologically jumbled generalizations when she uses her interviewees as sources. Take, for example, her discussion of the way hiring is managed in the mathematical community. Several of the women mathematicians say that they basically had their first, second, even third positions handed to them; Mary Ellen Rudin, in fact, claims never to have actually applied for a job in her life (p. 14). Henrion suggests that this situation is common, even universal, in the mathematical community today and that connections with prominent persons or groups are more important than individual merit. In support of this she quotes Karen Uhlenbeck:

> That's how you get a job. It's really bad the last few years. There were no jobs for a while, so that wasn't good. It hasn't gotten any better in the abstract because every place like this [University of Texas at Austin] gets 750 job applications. We can't process that. So you hire people that you hear about—which means that your pals call you up. So it's gone back to the 'good old boy' system without any question because we can't handle the paperwork. Nobody really desires that…. [But because of the paperwork], you hire people that you know. For instructors it's pretty much who your friends are out there, because they haven't even had the opportunity to publish their work. (p. 13)

If, indeed, Uhlenbeck said this, and if she meant it the way it sounds, the University of Texas appears to be leaving itself wide open for lawsuits. What is more curious to me, however, is that Henrion not only accepts this interpretation of present-day hiring practices as accurate but does not particularly object to such practices. Yet most mathematicians I approached about this categorically rejected Uhlenbeck's and Henrion's version of the hiring process. One (born 1948) said he had applied for all of his own jobs and can vouch for the fact that his department (in a major state university) reviews all applications for every opening. Moreover, he said that he personally has never received a call from a "pal" of the type that Uhlenbeck describes.[3] This does not, of course, mean that such things do not happen. Certainly Henrion's cataloguing of them in the past (especially from the 1940s through the 1970s), and perhaps in Texas today, appears to be accurate. What seems doubtful is that they are still the norm in the profession.

Exaggerated rumors about hiring practices can be quite harmful for young people desiring to become mathematicians. Women graduate students could get discouraged because they might believe that their advisers are not powerful enough to wangle jobs for them, or even because their advisers expect them to apply for their own positions in the normal way. In either case, Henrion's skewed and cynical picture could contribute to lower morale among women graduate students.

I have been married to a mathematician for over twenty-five years. Partly because of that, and partly because my own research is in the history and current status of women in mathematics and the sciences, I tend to associate a lot with mathematicians of both sexes. Much of my disquiet over Henrion's account stems from the extent to which I find it discordant with my own research and with my friends' experiences and perceptions. Take, for example, Henrion's insistence that women mathematicians feel themselves to be outsiders even when they are extremely successful. While I do not question the perception, I wonder to what extent this is gender-specific. Virtually all the mathematicians I know *of both sexes* like to style themselves as outsiders on occasion. In fact, several of Henrion's interviewees explicitly or implicitly cited the lone-wolf image of the mathematician as being attractive to them, presumably because it appeals to some aspect of their own personalities.

Is it not part of the folklore of the mathematical community that the profession does not ostracize loners? Henrion puts a negative spin on this part of the mathematician stereotype by mocking the "rugged individualism" of the "mathematical Marlboro man." I can certainly see her point that the loner image belies the extent of cooperation,

[2] *For more information on this, see my "Sofia Kovalevskaia and the Mathematical Community",* The Mathematical Intelligencer ***6****, no. 1 (1984). It was only after Kovalevskaia's death that her reputation suffered at the hands of certain mathematicians; for details see Koblitz, "Changing Views of Sofia Kovalevskaia," in* The Legacy of Sonya Kovalevskaya *(Linda Keen, ed.),* Contemp. Math.*, vol. 64, Providence, RI: Amer. Math. Soc., 1987) .*

[3] *Obviously, the reputation and prominence of the thesis adviser and the writers of letters of recommendation have an influence. That is not surprising or improper. But what Uhlenbeck claims is going on is a very different matter.*

collaboration, and community among mathematicians. But there is a positive side to the stereotype also, which Henrion herself implicitly acknowledges through her accounts of the eleven women mathematicians. Namely, the mathematical community tends to be more welcoming of eccentricity, diversity, and personal quirkiness than many other scholarly professions, my own (history) emphatically included. If those who chose mathematics had wanted to join a profession that expects conformity, they might have done better to become historians or political scientists!

The final chapter of Henrion's book, "The Quest for Certain and Eternal Knowledge," will no doubt arouse contradictory reactions in many readers. Henrion says that a series of questions informs her last chapter: "But what is the basis for this belief that mathematics is certain and eternal knowledge? Is it an accurate description of mathematics? What impact does it have on women? Are there other ways to think about mathematical knowledge?" (p. 235). Henrion points out that "the idea of proof is evolving, controversial, and subject to social negotiation" (pp. 245–6). It is a mistake, she argues, to equate mathematics with formal deductive reasoning, because this "presents an artificially narrow view of what mathematics is all about, and in this way is misleading, if not inaccurate" (p. 246). Henrion reminds us that intuition and aesthetic sense play as important a part in mathematics as does formal proof.

All well and good. There is little if anything here with which the vast majority of mathematicians would disagree. Henrion goes further, however. She says:

> Ultimately, it is misleading to speak of 'pure mathematics' untainted by human values, bias, and customs, and it is impossible to separate the product from the process, or mathematics from the mathematician or the mathematical community. Like all intellectual activity, mathematics has subjectivity woven into the fabric of its existence. (p. 250)

This stance would certainly please postmodern gender and science theorists such as Evelyn Fox Keller and Sandra Harding, to whom Henrion refers favorably. And statements such as these appear to place Henrion squarely on the side of the science critics in the current "Science Wars."[4] Henrion's stance, however, is less likely to appeal to most people who have direct experience of the nature of mathematical research and who have found it quite possible to separate the content of mathematics (the theorems) from the social aspects of the mathematical profession (questions of mathematical taste, allocation of resources, etc.). Such readers are apt to find Henrion's attempts to conflate mathematical content and community confusing, misguided, and ultimately unconvincing.

Despite these drawbacks, *Women in Mathematics* is worth reading. It is the kind of book that would make a provocative centerpiece for a math graduate student discussion group or for a meeting of an association of women mathematicians or scientists. Virtually no one in the mathematical community will agree with everything Henrion says. But the book will be useful for generating debate, and it makes an important contribution to scholarship on the interrelations of gender, mathematics, and culture in the U.S. in the second half of the twentieth century.[5]

[4] *Those unfamiliar with this debate (which has become exceedingly vitriolic in recent years) can consult Paul R. Gross and Norman Levitt,* Higher Superstition *(Baltimore, MD: Johns Hopkins Press, 1994) and Gerald Holton,* Science and Anti-Science *(Cambridge, MA: Harvard University Press, 1993) for the views of the "pro-science" camp. The collection* Science Wars, *edited by Andrew Ross (Durham, NC: Duke University Press, 1996), represents the "debunkers" of the scientific enterprise; among the more readable and reasonable pieces are those by Sandra Harding, Sharon Traweek, and Richard Levins. See also the articles by Michael Sullivan and Evans Harrell in the* Notices, *October 1996.*

[5] *My thanks to Judith Arms, Tom Duchamp, Neal Koblitz, Beth Ruskai, and Cora Sadosky for commenting on previous versions of this review.*